

CLAIMS

What is claimed is:

1. A programmable apparatus for building query statements, comprising
a processor;
a memory;
a query schema in the memory, the query schema describing one or more query entities;
a select macro in the memory; and
a macro expansion program in the memory directing the processor to
 separate the select macro into a plurality of macro tokens;
 compare each macro token with each query entity; and
 responsive to matching a macro token with a query entity, expand the matched macro
 token according to the query schema.
2. The programmable apparatus of claim 1 wherein
each query entity comprises one or more entity fields; and
the macro expansion program in the memory further directs the processor to
 execute the modified select macro;
 create a data object for each macro token that matches a query entity, each data object
 having one or more data attributes; and
 assign entity field values to data attributes according to the query schema.
3. The programmable apparatus of claim 1 wherein
the select macro comprises a select-clause; and

the macro expansion program in the memory further directs the processor to append a from-clause to the select-clause, the from-clause comprising all query entities that are matched with macro tokens in the select-clause.

4. The programmable apparatus of claim 3 wherein

each query entity comprises one or more entity fields; and

the macro expansion program in the memory further directs the processor to

execute the modified select macro;

create a data object for each macro token that matches a query entity, each data object

having one or more data attributes; and

assign entity field values to data attributes according to the query schema.

5. The programmable apparatus of claim 3 wherein:

the query schema further comprises one or more schema relations, each schema relation defining relationships between two or more query entities; and

the macro expansion program in the memory further directs the processor to

compare each macro token in the select-clause with each query entity defined in a schema relation;

responsive to matching a macro token with a schema relation, append a join-clause to

the from-clause according to the schema relation; and

if the schema relation includes one or more query entities that are excluded from the

from-clause, append the excluded query entities to the from-clause.

6. The programmable apparatus of claim 5 wherein

each query entity comprises one or more entity fields; and

the macro expansion program in the memory further directs the processor to

execute the modified select macro;

create a data object for each macro token that matches a query entity, each data object

having one or more data attributes; and

assign entity field values to data attributes according to the query schema.

7. The programmable apparatus of claim 6 wherein the select macro is written with Structured Query Language constructs.
8. The programmable apparatus of claim 6 wherein the macro expansion program is an object method program.
9. The programmable apparatus of claim 6 wherein the query entity is a database table.
10. The programmable apparatus of claim 6 wherein the query entity is a database view.
11. A computer readable memory for causing a computer to build query statements, comprising:
 - a computer readable storage medium;
 - a select macro stored in the storage medium;
 - a query schema stored in the storage medium, the query schema describing one or more query entities; and
 - a macro expansion program stored in the storage medium, wherein the storage medium, so configured by the macro expansion program, causes the program to
 - separate the select macro into a plurality of macro tokens;
 - compare each macro token with each query entity; and

responsive to matching a macro token with a query entity, expand the matched macro token according to the query schema.

12. The computer readable storage medium of claim 11 wherein each query entity comprises one or more entity fields; and the macro expansion program stored in the storage medium further directs the processor to execute the modified select macro;
create a data object for each macro token that matches a query entity, each data object having one or more data attributes; and
assign entity field values to data attributes according to the query schema.
13. The computer readable storage medium of claim 11 wherein the select macro comprises a select-clause; and the macro expansion program stored in the storage medium further directs the processor to append a from-clause to the select-clause, the from-clause comprising all query entities that are matched with macro tokens in the select-clause.
14. The computer readable storage medium of claim 13 wherein each query entity comprises one or more entity fields; and the macro expansion program stored in the storage medium further directs the processor to execute the modified select macro;
create a data object for each macro token that matches a query entity, each data object having one or more data attributes; and
assign entity field values to data attributes according to the query schema.
15. The computer readable storage medium of claim 13 wherein

the query schema further comprises one or more schema relations, each schema relation defining relationships between two or more query entities; and

the macro expansion program stored in the storage medium further directs the processor to compare each macro token in the select-clause with each query entity defined in a schema relation;

responsive to matching a macro token with a schema relation, append a join-clause to the from-clause according to the schema relation; and

if the schema relation includes one or more query entities that are excluded from the from-clause, append the excluded query entities to the from-clause.

16. The computer readable storage medium of claim 15 wherein

each query entity comprises one or more entity fields; and

the macro expansion program stored in the storage medium further directs the processor to execute the modified select macro;

create a data object for each macro token that matches a query entity, each data object having one or more data attributes; and

assign entity field values to data attributes according to the query schema.

17. The computer readable storage medium of claim 16 wherein the select macro is written with Structured Query Language constructs.

18. The computer readable storage medium of claim 16 wherein the macro expansion program is an object method program.

19. The computer readable storage medium of claim 16 wherein the query entity is a database table.

20. The computer readable storage medium of claim 16 wherein the query entity is a database view.

21. A method of deploying a program for building query statements, comprising the steps of:

installing the program on a computer;

wherein the program performs the steps of:

separating a select macro into a plurality of macro tokens;

comparing each macro token with one or more query entities described in a query schema;

responsive to matching a macro token with a query entity, expanding the matched macro token according to the query schema.

22. The method of claim 21 further comprising the steps of:

executing the modified select macro;

creating a data object for each macro token that matches a query entity, each data object having one or more data attributes; and

assigning entity field values to data attributes according to the query schema.

23. The method of claim 21 further comprising the step of:

appending a from-clause to the select macro, the from-clause comprising all query entities that are matched with macro tokens in the select macro.

24. The method of claim 23 further comprising the steps of:

executing the modified select macro;

creating a data object for each macro token that matches a query entity, each data object having one or more data attributes; and

assigning entity field values to data attributes according to the query schema.

25. The method of claim 21 further comprising the steps of:

comparing each macro token with one or more query entities defined in a schema relation;

responsive to matching a macro token with a schema relation, append a join-clause to the from clause according to the schema relation; and

if the schema relation includes one or more query entities that are excluded from the from-clause, append the excluded query entities to the from-clause.

26. The method of claim 25 further comprising the steps of:

executing the modified select macro;

creating a data object for each macro token that matches a query entity, each data object having one or more data attributes; and

assigning entity field values to data attributes according to the query schema.

27. The method of claim 26 wherein the select macro is written with Structured Query Language constructs.

28. The method of claim 26 wherein the query entity is a database table.

29. The method of claim 26 wherein the query entity is a database view.

30. An apparatus for building query statements, the apparatus comprising:

means for separating a select macro into a plurality of macro tokens;

means for comparing each macro token with one or more query entities described in a query schema;

responsive to matching a macro token with a query entity, means for expanding the matched macro token according to the query schema;

means for appending a from-clause to the select macro, the from-clause comprising all query entities that are matched with macro tokens in the select macro;

means for comparing each macro token with one or more query entities defined in a schema relation;

responsive to matching a macro token with a schema relation, means for appending a join-clause to the from clause according to the schema relation;

if the schema relation includes one or more query entities that are excluded from the from-clause, means for appending the excluded query entities to the from-clause;

means for executing the modified select macro;

means for creating a data object for each macro token that matches a query entity, each data object having one or more data attributes; and

means for assigning entity field values to data attributes according to the query schema.

31. The apparatus of claim 30 wherein the select macro is written with Structured Query Language Constructs.
32. The apparatus of claim 30 wherein the query entity is a database table.
33. The apparatus of claim 30 wherein the query entity is a database view.